PATENT SPECIFICATION

726,248

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COMPLETE SPECIFICATION

Improvements in Fuel Injection Valves for Internal Combustion Engines

We, ROBERT BOSCH G.M.B.H., a German Company, of 4, Breitscheidstrasse, Stuttgart W, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to improvements in fuel injection valves for internal combustion engines comprising a valve body and a valve needle actuated by fuel pressure, the valve body and the valve needle having conical surfaces converging in the direction of fuel flow through the injection valve and co-operating to provide a seat for the valve needle.

An object of the invention is to increase the durability of such injection valves by reducing or avoiding corrosion which is liable to occur at the conical seating surface of the valve needle and frequently limits the life of the injection valve.

This is obtained in accordance with this invention by the feature that, on the fuel supply side of the line or area of seating contact of the valve needle with the valve body, the respective cone angles of the conical surface of the valve needle and that of the valve body differ by at the most 20°, while on the fuel discharge side of said line or area the respective cone angles of the conical surface of the valve needle and that of the valve body differ by 0.5° to 4°.

In the accompanying drawing, four forms of construction are illustrated by way of example.

Figures 1—4 each show a longitudinal section through the part of an injection valve including the valve seat.

In all the examples the valve body is indicated by 1 and the valve needle by 2. The needle is guided in the valve body in a non-illustrated, but generally known manner. The fuel is supplied into the annular space 3 between the valve body 1 and the needle 2 and is ejected when the valve is opened through nozzle openings 4. Furthermore, in all the examples the cone angle of the conical surface in the valve body disposed on the fuel supply side of the valve seat is indicated by α and the corresponding cone angle of the conical surface of the valve needle by β. The difference of these two angles $(\alpha-\beta)$, which in all the examples shown is 10°, amounts at the most to 20°. The cone angle of the conical surface of the needle on the fuel discharge side of the valve seat is indicated by γ and the corresponding angle for the valve body by δ.

In the example as shown in Fig. 2, there is in the valve body an additional conical surface having a cone angle ϵ, which intersects the conical surface having the cone angle α at a distance a from the valve seat. The distance a is at least half a millimetre in size. The angle ϵ in the form of construction according to Fig. 2 is 3° larger than the angle α but may be larger by any angle in the range 3° to 5°.

The valve seat surface in the examples as shown in Figs. 1 and 3, geometrically considered, is only a line which, however, owing to the high specific pressure and a small change of form at this point, becomes in fact a very narrow annular surface.

In the examples shown in Figs. 2 and 4, the geometrical valve seat surface amounts to a narrow conical surface, the axial height h of which is approximately 0.2—0.3 mm. The angular difference $(\gamma-\delta)$ amounts to 2° in the forms of construction illustrated, but may alternatively be in the range 0.5° to 4°, which is therefore somewhat wider than the hitherto usual range of 0.5° to 1.5°.

In the examples according to Figs. 1 and 2 the angles α and δ are equal, whilst the angles β and γ differ. In the examples as shown in Figs. 3 and 4 the angles α and δ differ while the angles β and γ are equal.

All the examples show injection valves whose injection apertures are at the nozzle holes 4. The features of the invention may, however,

also be used with the same advantage with other types of injection valves where the conical surfaces of the valve body and needle converge in the direction of fuel flow, for example those whose injection opening is an annular slit which is formed in known manner by an injection pin on the end of the nozzle needle and an outlet in the valve body into which the injection pin extends.

What we claim is:—

1. A fuel injection valve for internal combustion engines comprising a valve body and a valve needle actuated by fuel pressure, the valve body and the valve needle having conical surfaces converging in the direction of fuel flow through the injection valve and co-operating to provide a seat for the needle valve, in which, on the fuel supply side of the line or area of seating contact of the valve needle with the valve body, the respective cone angles of the conical surface of the valve needle and that of the valve body differ by at the most 20°, while on the fuel discharge side of said line or area the respective cone angles of the conical surface of the valve needle and that of the valve body differ by 0.5° to 4°.

2. A fuel injection valve as claimed in claim 1, in which the difference between said cone angles on the said fuel supply side is substantially 10°.

3. A fuel injection valve as claimed in claim 1 or 2, in which the cone angle of the conical surface of the valve body is the same on both sides of the said line or area of seating contact.

4. A fuel injection valve as claimed in claim 1 or 2, in which the cone angle of the conical surface of the valve needle is the same on both sides of the said line or area of seating contact.

5. A fuel injection valve as claimed in claim 1 or 2, in which the seating contact of the valve body is over an area of width between 0.2 and 0.3 millimetres measured axially of the valve needle.

6. A fuel injection valve as claimed in claim 1 or 2, in which at least one half of a millimetre (measured axially of the valve needle) from the said line or area of seating contact there intersects with the conical surface of the valve body on the said fuel supply side a further conical surface, also on the valve body, whose cone angle is 3° to 5° greater than that of the first mentioned conical surface.

7. A fuel injection valve for internal combustion engines constructed as hereinbefore particularly described with reference to any one of the figures of the accompanying drawing.

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1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig.1

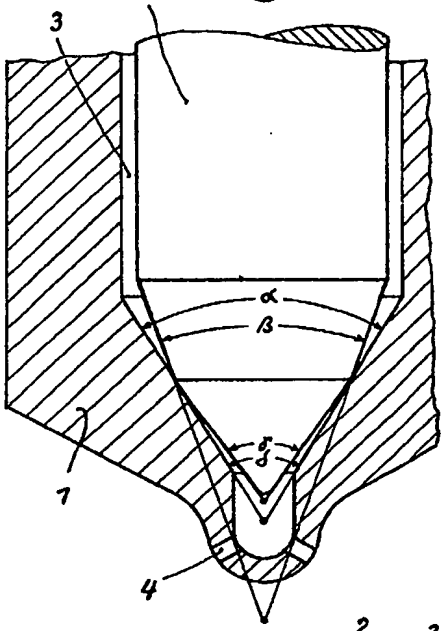
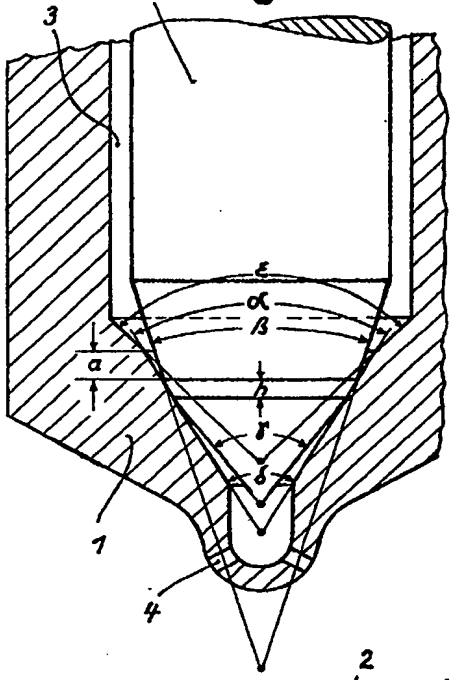


Fig.2



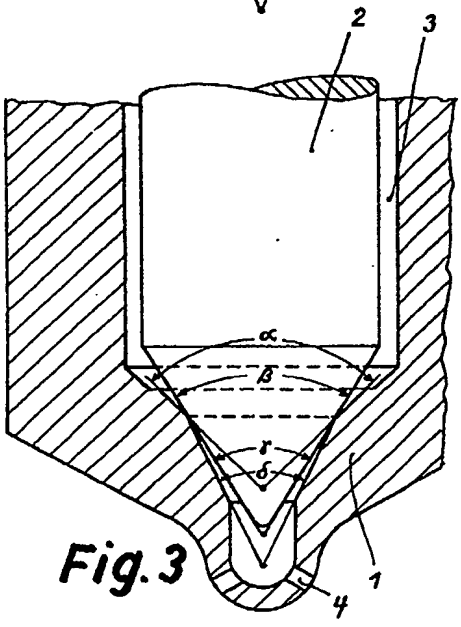


Fig.3

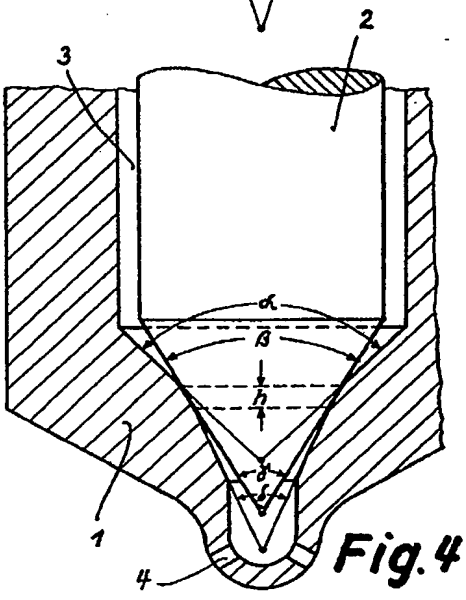


Fig.4